Continuous Assessment Test (CAT) – I AUG 2025

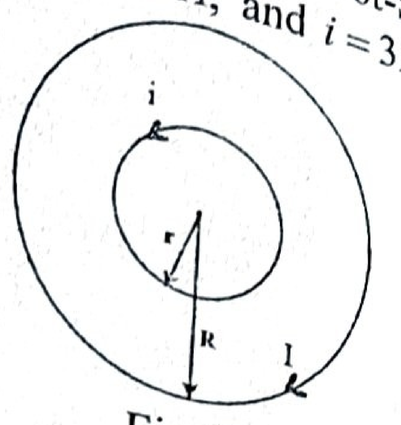
Programme	:	B.Tech (ECE)	Semester	:	FS 2025-26
Course Code & Course Title	:	BECE205L Engineering Electromagnetics	Class Number	:	CH2025260100348 CH2025260100349 CH2025260100346 CH2025260100351
Faculty	:	N. Chandrasekar Priyanka Das Anith Nelleri Amit Kumar	Slot	:	C1+TC1
Duration	:	90 Minutes	Max. Mark	:	50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level
1.	(a)	Given point $P(-2,6,3)$ and vector $\mathbf{A} = y\mathbf{a}_x + (x+z)\mathbf{a}_z$, express P and $\mathbf{A}$ in spherical coordinate system. Evaluate $\mathbf{A}$ at the point P in spherical coordinate system.	10	1	2
	(b)	Determine the curl of the vector field $\mathbf{A} = xy\mathbf{a}_x + y^2\mathbf{a}_y - xz\mathbf{a}_z$. State whether the field has rotational nature.	5	1	2
2.	(a)	The region between two concentric spherical conducting shells is charge free. The radii of spheres are $r_1 = 0.5cm$, $r_2 = 1.0cm$ and the corresponding potentials are $V_1 = -50V$, $V_2 = 50V$. Determine the potential distribution and the electric field strength between the shells.	10	1	3
	(b)	In free space the electric flux density is given as $\mathbf{D} = 2y^2\hat{\mathbf{a}}_x + 4xy\hat{\mathbf{a}}_y - \hat{\mathbf{a}}_z \ \ mC/m^2$. Find the total charge in the region $1<x<2,\ 1<y<2,\ -1<z<4$, *cm*.	5	1	3
3		Given that the electric field in a certain region is $\mathbf{E} = (z+1)\sin\phi\hat{\mathbf{a}}_\rho + (z+1)\rho\cos\phi\hat{\mathbf{a}}_\phi + \rho\sin\phi\hat{\mathbf{a}}_z \ \ V/m$. Determine work done in moving a 4nC charge from	10	1	3

		(i) A(1,0,0) to B(4,0,0) (ii) B(4,0,0) to C(4, 30°, 0).				
4		Consider two concentric circular loops of wires carrying currents as shown in the Fig. 1. (i) Determine the magnetic field at the centre of the circular loops using Biot-Savart law. Given $R = 20cm$, $r = 14cm$, $I = 3A$, and $i = 3A$.  Fig.1 (ii) Keeping the current $I = 3A$ fixed and changing the value of current 'i', determine at what value of 'i' the magnetic field at the centre becomes zero.	10	2	2